How Private Equity funds manage Working Capital of acquired firms? Portuguese evidence

by

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Biography

André was born in Viseu 24 years ago. A single-child who grow up in Fornos de Algodres a small village near Serra da Estrela. Influenced by the business activity of his family and by his special attraction by politics early he chose economist as his future career. Thus, he chose in 2009 the prestigious School of Economics and Management of University of Porto (FEP) to graduate in Economics. He obtained his bachelor degree in Economics in 2013 with a grade of 13 out 20. After a gap year caused by a health problem, he was admitted on Master in Finance at FEP in 2014 to develop his passion in Finance. Simultaneously with the second year of the master, he worked in a Big4.

Bearing in mind that is in Master in Finance context that he has developed this dissertation joining with the supervision of Professor Miguel Sousa.

Acknowledgments

First of all, I have to thank to my parents with all support (emotional and financial) in these hard years of graduation. They sacrificed own comfort to give me the chance which they didn't have. Also, I have to thank my grandparents who helped my parents to support me financially, in this regard a special acknowledgment to my grandmother on father's side who due to the distance wasn't closed to me in my childhood but she overcompensated with all support. Unfortunately, she passed away this year and she can't attend this important moment, I hope/guess, where she will be, she feels proud of her grandson.

Moreover, I want to thank to my friends. Friends of yesterday that know me since my childhood and always gave me the emotional equilibrium. And friends of today that share with me similar ambitions and worries, especially friends that I made in first year of the master degree and in my first professional experience in a Big4 firm. The last ones gave an extraordinary support during this last year. In this regard, also a special acknowledgment for the friends that I made in the last 3 months in special and various contexts, extras efforts were given to me in these final steps.

Finally, the last but not the least, I thanks to Professor Miguel Sousa who had always patience, comprehension and good advices to give. Despite of all obstacles created by me he always was available. It is important denote that my passion on Corporate Finance was consolidated due to his influence.

Abstract

Working Capital Management (WCM) matters. We obtain strong evidence of a negative relationship between Cash Conversion Cycle, a measure of WCM, and Operating Performance, measured by three different versions of ROA, indicating as the best way to manage the Working Capital, the reduction of the Cash Conversion Cycle. When we analysed the possible impact of Private Equity ownership on the WCM of target companies, we don't find a (statistical) significant impact. Notwithstanding, we find weak evidence of Private Equity improvements on Days Sales Outstanding but not on Days Inventories Outstanding and Days Inventories Outstanding. Additionally, we obtain strong evidence that Private Equity firms chose companies that underperform others, if the performance is measured in terms of Gross Margin to total assets ratio, in the period before the acquisition improving their performance, consistent with value-added hypothesis. Although, Working Capital Management remains as a potential way to generate operating gains. Our sample is composed by 29 PE-backed firms in the period between 2007 and 2012 and 29 similar non PE-backed firms.

Key-words: Private Equity; operating performance; Working Capital

JEL-Codes: G31; G32; G34

Resumo

A gestão do fundo de maneio tem impacto na performance das empresas. Nós obtivemos forte evidência da existência de uma relação negativa entre o Ciclo de Conversão de caixa, usado como medida da gestão do fundo de maneio, e a performance operacional das empresas, indicando assim a redução desse ciclo como a melhor forma de gerir o fundo de maneio. A fim de verificar a influência do domínio societário dos fundos de Capital de Risco na gestão do fundo de maneio das empresas detidas, nós empreendemos duas diferentes análises: uma recaiu sobre todo o período em que as empresas adquiridas pelos fundos de Capital de Risco foram detidas por esses fundos e a outra recaiu sobre o período composto por 2 ou 3 anos antes e 2 ou 3 anos depois da aquisição. Não encontrámos evidência significativa de vantagem competitiva das empresas detidas por fundos de capital de risco na gestão do fundo de maneio nem evidência de qualquer impacto positiva nessa gestão. No entanto, analisámos o impacto da detenção por fundos de Capital de Risco em cada componente do Ciclo de Conversão de Caixa e obtivemos alguma evidência de impacto positivo na gestão da conta clientes (redução nos dias que demoram a cobrar dívidas de clientes). Adicionalmente, também encontrámos forte evidência de aumento da performance operacional após entrada dos fundos de Capital de Risco nas empresas quando medida pelo rácio Margem Bruta/Ativo Total, quesito onde as empresas adquiridas tinham pior desempenho anterior à aquisição, consistente com a hipótese de criação de valor. A nossa amostra é composta por 29 empresas detidas por fundos de capital de risco no período entre 2007 e 2012 e outras 29 empresas idênticas, mas não detidas por fundos de capital de risco.

Palavras-chave: Capital de risco; Performance Operacional; Fundo de Maneio

JEL-Codes: G31; G32; G34

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1. Introduction

The most recent report about Private Equity ("PE") done by PricewaterhouseCoopers[1] ("PwC") Germany shows a growth trend in the number and value of PE deals in Europe. In 2015, more than 2000 deals were made, representing almost 200 billion euros invested. PE investments are seen as a real alternative to the volatile equity markets. The same report mentions the rise of importance of operational improvements to PE investors, for instance 75% of them reveals that operational improvement is the factor with more influence in the returns, this increase in importance occurred after financial crisis, where credit availability decreased. On the other hand, the most usual explanation for returns, the financial leverage, is reported only by 6% of investors behind also of the multiple arbitrage.

However, the debate about the effects of PE ownership on portfolio companies is far from over. While positive impact of tax shields resulted by high leverage is consensual, operational performance's impact is not. This fact is not incompatible with the importance reported of operational gains, but it queries about PE skills to make those improvements.

During eighties the literature show strong evidence of positive operating gains, although nineties and more recently studies don't.

Kaplan (1989), Smith (1990) and Lichtenberg and Siegel (1990) studies show strong evidence of value creation on Leverage Buyouts ("LBO") through operating performance improvements. Although Guo et al. (2011) and Leslie and Oyer (2008) report inconsistent operating gains.

The capacity to make operational improvements could also depend among other factors on the maturity of Private Equity house (Acharya et al., 2010), the existence of experienced operating partners (Matthews et al., 2009) or the specialization of funds (Scellato and Ughetto, 2013).

The growing importance of operational improvements on PE portfolio companies and doubts on PE ability to do that makes our study very pertinent as we look to one of the companies' areas of potential improvements, Working Capital Management ("WCM").

[1] Roberts, S. a. N., E. (2016). Private Equity Trend Report 2016, PricewaterhouseCoopers.

In this context, a report done by The Boston Consulting Group[2] ("BCG") in 2012 indicates four main areas where PE companies can create operational value "*financial structure, bottom line, top line – core business and top line – expansion*". One of the most usual initiative used to improve operational creation value is the working capital optimization, indeed it was referred by 64% of PE firms interviewed in this report.

Moreover, the PwC report refers that WCM is one of the operational areas to improve and is referred as an important value-creation driver, but overlooked compared with "*strategic sourcing and placement*" and "*commercial optimisation*". Simultaneously, 44% of PE managers interviewed argued that WCM is the highest driver to create value.

Guo et al. (2011) also mentioned the use of a more efficient Working Capital as a driver of value creation.

In fact, a report about WCM done by EY[3] note a higher importance given to WCM compared with previous periods, probably caused by the rising of the cost of capital and external financing constraints.

The same report mentions an excess of $1.3 trillion invested in Working Capital ("WC") in the leading 2000 US and European companies in 2014, an amount which represents 7% of aggregate sales.

Moreover, in 2011 Inventories and Accounts Receivables represented 24% of total sales of US 1,000 leading companies and more than 18% of book-value of their assets. Those numbers illustrate the relevance of a WC's good management, excess cash invested in WC could be used to financing acquisitions and valuable projects. (Aktas et al., 2015)

Indeed, there is margin to improve WCM (Ek and Guerin, 2011) and more relevant the literature proves that WCM matters. Studies done by Baños-Caballero et al. (2014), Baños-Caballero et al. (2012), Deloof (2003) and Aktas et al. (2015) show significant evidence of WCM impact on firms' performance: stock and operational.

[2] Brigl, M. et al. (2012). The 2012 Private-Equity Report. Private Equity - Engaging for Growth, The Boston Consulting Group.
[3] EY(2015). All tied up: Working Capital Management report, EY Transaction Advisory Services.

Despite of the existence of doubts regarding PE ownership ability to make operational improvements, we judge pertinent analyse the relationship between WCM and PE ownership, being WCM a potential way to improve operating performance.

Therefore, proved the impact of WCM on Operational Performance, we tested the ability of PE-backed firms to manage WC, i.e., if PE-backed firms manage WC better than non PE-backed firms.

We used a sample of 29 PE portfolio companies in Portugal selected in the MergerMarket database together with 29 non PE-backed similar firms from SABI database and we didn't find significant evidence of competitive advantage on WCM of PE-backed firms. Then using a difference-in-difference model, we also didn't find that the improvements were caused by the PE acquisition of the firm, however when we tested PE acquisition impact in each component of Cash Conversion Cycle, we found evidence of a reduction on Days Sales Outstanding.

This dissertation is organized as follows: in Section 2 the literature review is presented. The methodology is explained in Section 3. The results are shown in Section 4 while Section 5 conclude.

2. Literature Review

Private Equity investments became recurrent/popular in 1980s due to creation value evidence and their "*exceptional*" returns. (Cuny and Tahnor, 2007)

Although financial crisis had negative effects on PE industry, there is evidence of value created by PE investments on PE portfolio companies (Kaplan, 1989); (Smith, 1990) (Davis et al., 2008).

For instance, Renneboog et al. (2007) refer a premium of 40% to shareholders of the pre-acquisition period in public to private transactions ("PTPs"), a high premium which could indicate a large scope to value creation after the acquisition.

Illustrating, PE skills to create value are compared with 2 alternative scenarios on Cuny and Tahnor (2007): hiring an external consultant or replacing current management. They conclude that PE buyout is the most successful way to create value.

Obviously, the impact on value creation will depend on the type of transaction: for instance, can differ from Management Buyout[1] ("MBO") to Management Buy-in [2]("MBI") or to Institutional Buyout [3]("IBO") (Renneboog et al., 2007).

2.1. How can PE create value?

Despite of the evidence of value creation ability of PE investments, sources of value creation are not clear. While leverage advantages are almost consensual, operating gains are not (Cuny and Tahnor, 2007).

Concerning this, Renneboog et al. (2007) study potential sources of value creation on PE investments. They conclude that PE shareholders create value through undervaluation, tax shield and incentives realignment. While, bondholder protection, ownership concentration, high FCF available, high stock market transaction costs and high takeover pressure had not significant impact on. PE transactions are backed by high leverage and consequently, interests' tax deductions increase. Obviously, the extension of tax shields will depend on tax system. Undervaluation is more observable in case of PTP transactions

[1] MBO happens when incumbent management acquires the firm with PE house support.
[2] MBI happens when outsider managers acquire the firm with PE house support.
[3] IBO happens when an incumbent institutional investor acquires the firm with PE house support.

where there is a share price, the higher price is undervalued the higher will be the possibility to increase value. Agency costs pre-transaction also have a positive relationship with potential value gains, mainly through incentives realignment, if pre PE-entry managers have a stake in ownership the margin to create value will be lower. Thus, this last source doesn't close the possibility to operational gains. Moreover, Scellato and Ugheto (2013) report reduction on agency costs and efficiency gains as sources of operational gains on PE European buyouts.

Also PE investments effects on growth (Engel, 2002), on patents production (Lerner et al., 2013), on productivity (Croce et al., 2013), on long-run market returns (Brav and Gompers, 1997) and on the probability to go public (Wright and Robbie, 1998) are reported.

Although leverage benefits are consensual and transversal, operating gains are not. Tax benefits as well as disciplinary effects of leverage are reported (Guo et al., 2011). Leslie and Oyer (2008) reveal weak evidence of operating gains likewise Scellato and Ugheto (2013) show a decrease on Profitability. Indeed, they note a decrease on operating profitability 3 years after the deal.

Even thought Guo et al. (2011) find evidence of small operating gains, they attest the importance of operational performance, reporting that it explain 20% of returns.

In fact, abnormal returns could be linked with sales and operating margin improvements post-acquisition period and out-performers deals linked with internal value-creation programs (Acharya et al., 2010).

With the financial crisis there was less credit available, thus PE firms have focused on operating improvements (Matthews et al., 2009).

Guo et al. (2011) argue for value creation on buyouts through a more efficient use of productive assets including Working Capital.

2.2. Working Capital Management as a tool to improve operational performance

As we previously have mentioned, there is a large amount of cash invested in WC, too large to be neglected, even more if financial markets are not perfect (Baños-Caballero et al., 2014).

In fact, there are practical implications of credit policy, suppliers' payments policy and inventories' management. For instance, a large inventory and a friendly credit policy may increase sales: building up a strong relationship with customers, hedging prices volatility and avoiding stock ruptures; while delaying suppliers' payments may decrease pre-payment discounts (Deloof, 2003). Otherwise, large inventories may increase the risk of stock's value losses, aggressive credit policy may increase the risk of customers' payments failures and quickly suppliers' payments may increase the risk of less quality on suppliers' products.

The best way to manage WC components may not be consensual, but there is evidence that WC decisions affect firm performance.

As WC has impact on operational performance, WCM also has impact on stock performance and firm risk (Aktas et al., 2015). Notwithstanding, we focus exclusively in operational performance.

Deloof (2003) use Cash Conversion Cycle (CCC) as measure of WCM and he finds evidence of a negative and linear relation between WCM and operational performance, i.e. as the "*time lag between the expenditure per the purchases of raw materials and the collection of sales of finished goods*" increases, operational performance decreases. In addition to an aggregate analysis, he analysed the impact of each component of WC in operational performance and a negative relation between days inventory outstanding (DIO) and days sales outstanding (DSO) with operational performance was found. However, the same relation was found in respect to days payable outstanding (DPO).

Instead controlling each WC's component individually, it is better controlling CCC, because each component may influence others (Baños-Caballero et al., 2012)

Moreover, Baños-Caballero et al. (2012) explain that a more aggressive WC policy (low WC) may result in higher returns and higher risk and a less aggressive WC policy (high

WC) may result in lower returns and lower risk. Thus, the existence of a trade-off between risk and return may indicate the possibility of a non-linear relation and consequently the existence of an optimal value. In this respect, Baños-Caballero, García-Teruel et al. (2012) and Aktas et al. (2015) check a potential non-linear relation between WCM and firm performance and they conclude that may exist an optimal value of WC. Firms with a very low WC level may improve operational performance, increasing that level and firms with a high WC level may improve operational performance reducing that.

Existing an optimal level of WC, the convergence to this level will improve operational performance and this level can be influenced by financial constraints, firms more financial constrained should have less cash invested on WC (Baños-Caballero et al., 2014)

Nevertheless, a linear relationship is the most consistent and verified, for that reason we adopted it in our study.

2.3. Discussed and opened questions

PE industry on Portugal is not highly developed, it will be useful reveal interesting insights about PE effects in Portuguese companies: Do Portuguese PE-backed firms outperform Portuguese non PE-backed firms? Will WCM be an explanation?

Under potential over or underperformance hypothesis of PE-backed firms, it is necessary to check if these differences are created by PE-entry or if these differences are inherent to PE-backed firms. Like Meles et al. (2014) we test "*ex-ante screening role hypothesis*" and "*value-added hypothesis*", analysing (1) the period composed by all PE-ownership years and (2) periods composed by pre and post-acquisition years.

Obviously, without financial data limitations, a more extensive study would have been done. For example, PE firm maturity may have an impact on the operational improvements as more experience would mean a higher ability to manage companies (Acharya et al., 2010); PE specialists may perform better (Scellato and Ughetto, 2013); PE bank-based investors may overperform other types. (Hellman et al., 2008); perhaps WCM importance should be higher for financial constrained companies (Baños-Caballero et al., 2014).

3. Sample & Methods

3.1. Sample

3.1.1. Sample Selection

Our sample of Portuguese PE portfolio companies was collected from MergerMarket, for the period between 2007 and 2014.

From the initial 94 companies, financial companies and holding companies were excluded as well as companies without financial data for at least two years before and two years after the acquisition by a PE firm. Financial information was collected from SABI database. Finally, were excluded companies in which PE firms didn't have a majority stake. Those restrictions reduced our sample to 29 PE-backed firms.

In order to create a comparable group we select a control group of 29 similar non PE-backed firms following Meles et al. (2014) matched-pair methodology: a basic comparable firm approach where similar companies have the same two-digit CAE, their sales are between 75% and 125% of PE-backed firm sales and have the closest EBITDA/Sales ratio, relative to the year before the acquisition.

3.1.2. Variables selection

As proxy for WCM we use CCC following Baños-Caballero et al. (2014) and Deloof (2003).

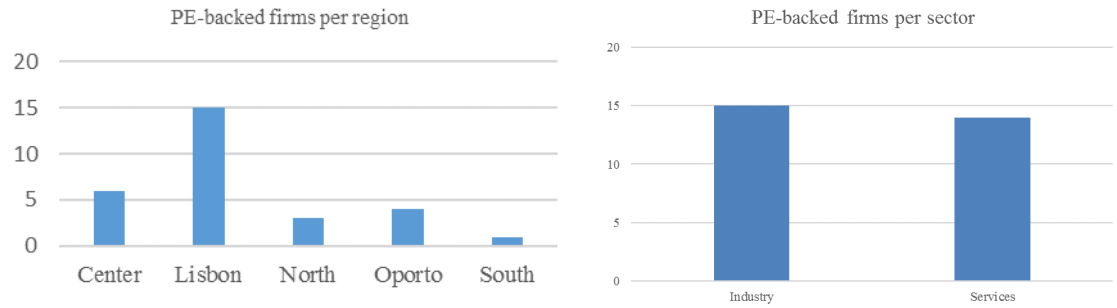
In regard to operational performance, we use three different measures of operational performance: Gross Margin to Total Assets ratio ("Gross Margin/TA"), EBITDA to Total Assets ratio ("EBITDA/TA") and EBIT to Total Assets ratio ("EBIT/TA").

Leverage, measured as Total Debt to Total Assets ratio, Fixed Assets growth, measured by the relative variation on Fixed assets relative to previous period, and size, measured by the logarithm of sales, were use as control variables.

3.1.3. Sample and Descriptive Statistics

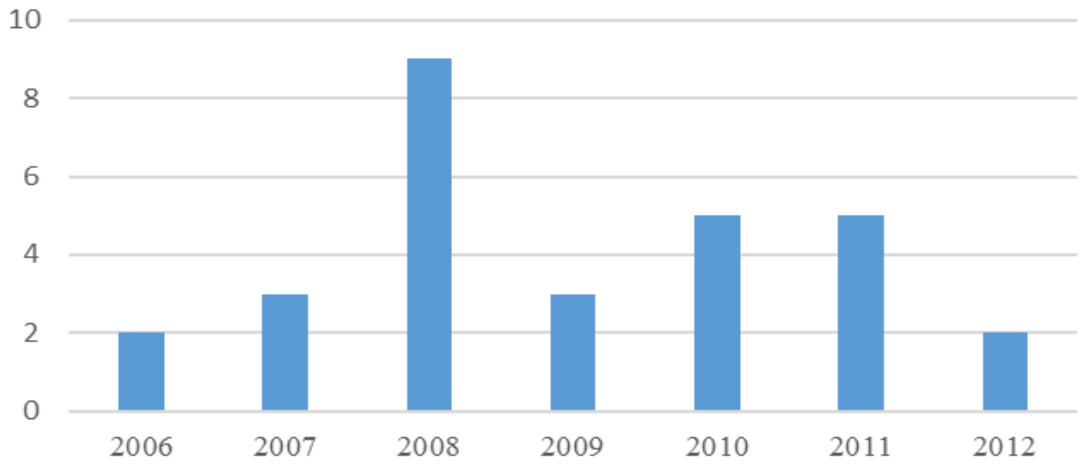
As shown in Figure 1, half of the companies in our sample are from Lisbon Metropolitan area and our companies are almost evenly divided between the industry and services sector. Nearly 80% of the PE firms are Portuguese, indicating a possible home bias.

Figure 1 – PE-backed firms distributed per Portugal-7 region and per sector



Additionally, according to Figure 2, that most of the companies were acquired in 2008.

Figure 2 – PE-entries per year



To control for possible outliers we winsorized the variable as in Acharya et al. (2010).

As we can see in Table 1, during the years of PE-ownership, PE-backed firms have in average a lower level of Cash Conversion Cycle, while the operational performance was better than the performance of non PE-backed firms.

Table 1 – Descriptive statistics of PE-backed firms during PE ownership period, comparing with similar non PE-backed firms. Data is winsorized by 0.05 and 0.95.

PE-backed

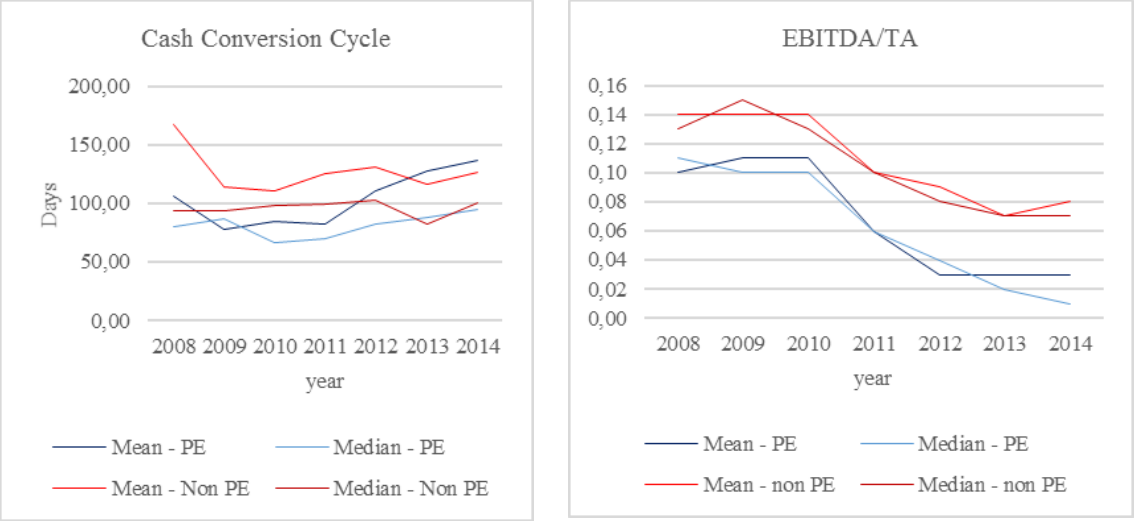
2008-2014	*CCC (days)*	*Gross margin/TA (%)*	*EBITDA/TA (%)*	*EBIT/TA (%)*
Mean	107	52	5	1
Median	80	49	5	2
Max	427	159	27	18
Min	-12	12	-9	-16
Std. Dev	104	24	9	8

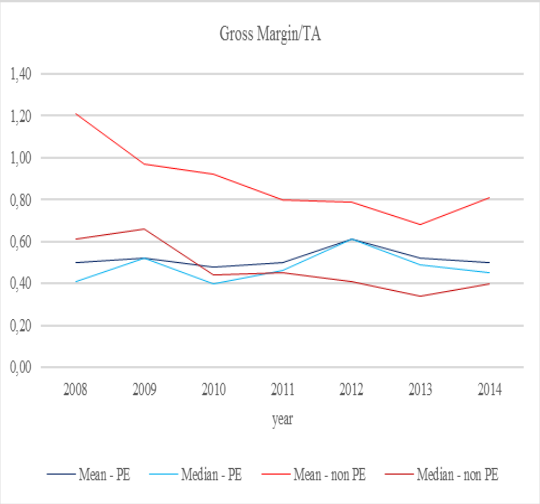
Non PE-Backed

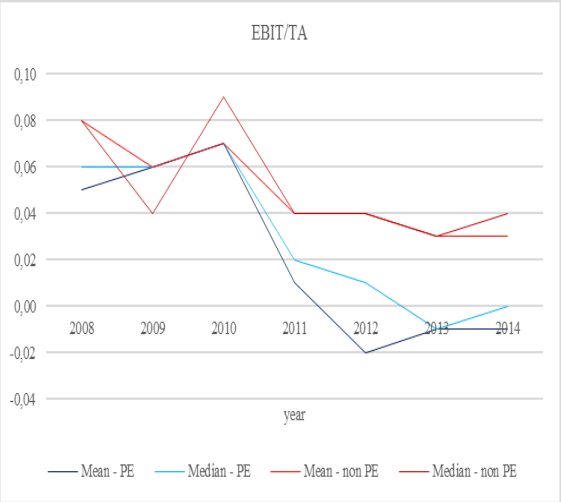
2008-2014	*CCC (days)*	*Gross margin/TA (%)*	*EBITDA/TA (%)*	*EBIT/TA (%)*
Mean	125	8	10	4
Median	95	42	9	4
Max	427	247	27	18
Min	-13	12	-9	-16
Std. Dev	105	78	9	8

As can be seen in Figure 3, lower CCC level on PE-backed firms is not always clear, in fact there is a convergence in the last three years. Regarding operational performance, it depends of the measure used, however a decrease within the years is observed as well an apparent non PE-backed over performance over the years. This over performance of non PE-backed firms is observed more clearly when measured by EBITDA/TA ratio.

Figure 3 – Evolution of mean and median of CCC, EBITDA/TA, Gross margin/TA and EBIT/TA on PE and non PE samples between 2008 and 2014







In general terms, we could say that PE-backed firms underperform non PE-backed firms.

Results are consistent with a possible competitive advantage of PE-backed firms in terms of WCM, but this not necessarily mean that is due to the PE acquisition impact. In order to analyse that possibility, we should check changes occurred in the company after the PE acquisition. (see table 2)

Looking for the average value, the results suggest a decrease in CCC, while the results regarding operating performance measures are undefined. There is only an improvement in Gross Margin consistent with positive PE impact on sales and sales margin.

Table 2 –Variation on CCC, Gross margin/TA, EBITDA/TA and EBIT/TA. Note: Data is winsorized by 0.05 and 0.95.

PE backed	*CCC (days)*	*Gross margin/TA (%)*	*EBITDA/TA (%)*	*EBIT/TA (%)*
Mean				
3 to 2-before	8.51	0	-1	-2
2 to 1-before	5.88	3	-3	-1
1-before to 1-after	-22.20	20	-8	-7
1 to 2-after	-7.80	2	1	0
2 to 3-after	1.93	8	-3	-3
Median				
3 to 2-before	7.29	0	-1	-3
2 to 1-before	-13.30	3	-5	-2
1-before to 1-after	4.67	37	-9	-3
1 to 2-after	-21.47	-5	3	1
2 to 3-after	-1.97	3	-4	-4

3.2. Methodological Considerations

Having in my mind that the main objective of this dissertation is to test whether PE ownership has any impact in the WCM, two models were regressed. The first, test whether PE-backed firms have competitive advantages on WCM comparing to non PE-backed firms. The second, test if the acquisition by a PE firm have impact on the WCM of acquired companies, i.e. Screening hypothesis and Value-added hypothesis are both tested here.

However, before move to the main objective of this dissertation, we are going first to check if WCM (and which component(s)) have impact on operational performance of the firm. For this purpose, we follow Deloof (2003) linear model, applying OLS regressions.

$$(1.1)\quad Y_i = \beta_0 + \beta_1 CCC_i + \beta_2 Controls_i + \beta_3 Dyears_i + \mu_i$$

Where Y_i represents the operational performance measures: Gross margin/TA, EBITDA/TA or EBIT/TA ratio; CCC is the Cash Conversion Cycle given by Days sales outstanding ("DSO") plus Days Inventories outstanding ("DIO") less Days Payables outstanding ("DPO") converted to years; Control variables includes Leverage, measured by the Total Debt to Total Assets ratio ("LEV"), Fixed assets growth, measured by the relative variation on Fixed assets relative to previous period ("G"), and Size, given by logarithm of sales ("SIZE"). Additionally, dummy variables (Dyears), which represent each year of our sample are also included.

The signal of β_2 will indicate how the cash conversion cycle affects the WCM, a positive sign would suggest that an increase of CCC will improve the operating performance of the company and so the best strategy for the company to manage WC would be increase the CC, a negative signal would suggest the opposite.

According to the past literature, we expect a negative sign, i.e. the lower the CCC, the higher will be operational performance:

H1: CCC have a negative impact on the operational performance, i.e. as CCC increases operational performance gets worse.

Additionally, we check how each individual WC component impacts the operational performance, i.e. DSO, DIO and DPO:

$$(1.2)\quad Y_i = \beta_0 + \beta_1 DSO_i + \beta_2 DIO_i + \beta_3 DPO_i + \beta_4 Controls_i + \beta_5 Dyears_i + \mu_i$$

Moreover, the inclusion of a PE-dummy that equals 1 when firm is PE-backed firm and 0 otherwise, allows to isolate the possible effect of PE ownership in the operational performance. This regression allows us to check if Operational Performance has also sensitivity to WCM in case of PE firms.

$$Y_i = \beta_0 + \beta_1 CCC_i + \beta_2 (CCC_i * PE_i) + \beta_3 Controls_i + \beta_4 (Controls_i * PE_i) + \beta_5 Dyears_i + \mu_i$$

We regress the same to the equation 1.2, i.e. instead of CCC and CCC*PE we use DSO, DIO, DPO and these variables multiplied by dummy PE.

3.2.1. PE-backed vs non PE-backed firms

In order to check the potential competitive advantage of PE-backed firms in operational performance and WCM, we restricted our data only for the period where PE-backed firms are owned by PE firms.

First, we started by regress equation (2.1) and then we regress the same equation with each component of CCC (DSO, DIO and DPO) as dependent variable, controlling in this case by the others components:

$$(2.1)\quad CCC_i = \alpha_0 + \alpha_1 PE_i + \alpha_2 Controls_i + \alpha_3 Dyears_i + \alpha_4 Dsector_i + \mu_i$$

Where Dsector is a dummy variable, that takes the value of 1 when the company is an industrial company and 0 otherwise, used to control for possible industry effects.

H2: PE-backed firms have a lower CCC, that would suggest PE-backed firms have a better WCM.

We should however be aware that if in the second regression the coefficient associated to PE is negative and significant this does not indicate that PE firms improve WCM of acquired companies, this only attest the potential competitive advantage of this type of companies. However, this better results in terms of WCM could be resulted from a selection process based on WCM – "*ex ante screening role hypothesis*" (Gompers and Lerner 2001, Baum and Silverman 2004), Therefore in any case, if a competitive advantage is attested or not, the potential PE impact will be studied in next subsection.

3.2.2. PE impact

As discussed before, a better performance may result of "*ex-ante screening role hypothesis*" (Gompers and Lerner, 2001; Baum and Silverman, 2004) or "*value-added hypothesis*" (Hellman and Puri, 2002; Ferreti and Meles, 2011).

As the previous analysis only compares PE-backed firms' performance with non PE-backed firms' performance, we then use a *difference-in-difference* method as Acharya et al. (2010) to verify if PE acquisition has any impact in the PE-backed firms' performance in Working Capital terms.

For that purpose, we include a new dummy AF, that takes the value of 1 if the observation is from a year after the acquisition year and 0 otherwise:

(2.2) $CCC_i = \delta_0 + \delta_1(PE_i\ X\ AF_i) + \delta_2 PE_i + \delta_3 AF_i + \gamma_n Controls_i + \varphi_t Dyears_i + \theta_i Dsector_i + \mu_i$

δ_2 represents the impact of the nature of firms: PE-backed or non PE-backed and PE-target, δ_3 represents the impact of post PE-acquisition years and $\delta_1$represents the impact of PE ownership after PE acquisition.

If we assume that the best WCM is the one that reduces the CCC, $\delta_1+\delta_3$ should be negative to suggest that the PE adds value through a better WCM.

H3: PE-acquisition improves WCM, i.e., reduces the company CCC.

Table 3 summarizes how the *difference-in-difference* method works.

Table 3 – Difference-in-Difference regressors analysis

	PE-backed	**Non PE-backed**	**Difference**
Before	$\delta_0 + \delta_2$	δ_0	δ_2
After	$\boldsymbol{\delta_0 + \delta_1 + \delta_2 + \delta_3}$	$\boldsymbol{\delta_0 + \delta_3}$	$\boldsymbol{\delta_1 + \delta_2}$
Difference	$\delta_1 + \delta_3$	δ_3	

3.2.3. Robustness checks

To consolidate our study, we used three different measures of operational performance (Gross Margin/TA, EBITDA/TA and EBIT/TA) to minimize potential accounting distortions following Deloof (2003). In addition, we used dummies for all years to control for time effects. Endogeneity problems were also minimized by using the group control of non PE-backed firms. The use of this group control also minimize potential sector effects.

Furthermore, we looked Durbin-watson statistic if lower than 1 and higher than 3, HAC EVIEWS's estimator was used to control potential Autocorrelation and Heteroscedasticity.

Obviously, panel data regressions could have improved the consistency of our results, however Portuguese PE data is not enough to obtain significant conclusions with those methods.

4. Results and Discussion

How should firms manage their WC? (subsection 4.1.) Do PE-backed firms manage WC better? (subsection 4.2.) A screening-selection or a value-added process? (subsection 4.3.) The answers to these questions are now presented, additionally we thought relevant obtain evidence of PE acquisition direct impact on operating performance. (subsection 4.4.)

4.1. What is the best WCM, in operating terms?

To understand how the CCC affects the operational performance we regress equation (1.1.). If β_1 is negative, it means there is a negative linear relationship, which suggest that the best WCM practice is to reduce the CCC. If β_1 is positive the conclusion will be opposite.

As can be seen in Table 4 (see below) $\beta_1$is consistently negative and statistically significant except when the operational performance is measured by the EBIT/TA ratio. When the CCC decreases 30 days (1 month), Gross margin/TA ratio increases by a minimum of 4.49 pp (=53.85/12 months) to a maximum of 5.68 pp (=68.14/12 months), while when operating performance is measured by EBITDA/TA this ratio increases by approximately 0.50pp. If CCC impact on EBIT/TA was significant, a month increment on CCC would mean a reduction of 0.15 pp on EBIT/TA ratio.

The relevant results for this study is the negative relationship between the CCC and the operating performance, suggesting that the best way to improve the WCM is reducing the CCC.

Moreover, we can verify that the impact of WCM on Gross Margin/TA ratio is the highest, a minimum impact of more 1.48 pp. in Gross Margin/TA per 10 days unless on CCC against a maximum impact of more 0.18 pp. in EBITDA/TA per 10 days unless on CCC.

*Table 4 – This table reports the estimation of Equation (1.1) for our sample composed by 29 PE-backed companies and 29 non PE-backed companies, using three different proxies of operating performance, expressed in percentual points (pp.). The operating performance measures are regressed agains the CCC, express in years. We include control variables and year-dummies. We look to Durbin-Watson statistic and we applied HAC estimator when this statistic has a value lower than 1 and higher than 3. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively. Variables are winsorised between 0.05 and 0.95 percentile. Standard deviations are in brackets.*

	Gross margin/TA			EBITDA/TA			EBIT/TA		
	(A)	(B)	(C)	(A)	(B)	(C)	(A)	(B)	(C)
CCC	-53.85 ***	-68.13 ***	-68.14 ***	-5.55 **	-6.51 **	-5.64 **	-2.17	-1.94	-1.42
	(13.46)	*(20.09)*	*(20.20)*	*(2.44)*	*(2.87)*	*(2.91)*	*(2.21)*	*(2.40)*	*(2.43)*
Controls	Not included	included	included	not included	included	included	not included	included	included
D years	not included	not included	included	not included	not included	included	not included	not included	included
Obs	284	284	284	284	284	284	284	284	284
R^2	0.07	0.14	0.15	0.03	0.11	0.18	0.01	0.19	0.22
Adj. R^2	0.07	0.12	0.12	0.03	0.10	0.14	0.00	0.17	0.19
F-stats	20.83 ***	10.90 ***	4.36 ***	8.54 ***	8.53 ***	5.35 ***	1.66	15.91 ***	7.14***
HAC	used	used	used	used	used	used	used	used	used

Looking for the impact of each CCC component on the operational performance (see table 5), we obtain evidence that a lower DSO and a lower DIO have a positive effect on the operational performance, while the impact of the DPO is not clear being only when the operating performance is measured by EBITDA/TA, where the coefficient is (negative) statistically significant. Indeed, DIO has higher impact than DSO as less one day in DIO results in an increase of approximately 0.50pp (=187.7/365) in Gross margin/TA ratio before controlling by control variables and time effects, while the same operational improvement is only obtained when DSO decreases 10 days.

Although DPO's impact is not significant on operational performance when measured by Gross Margin/TA and EBIT/TA ratio, its 10-day positive variation may decrease (with significance) EBITDA/TA ratio by 0.25 pp, approximately.

Consistent with the results to CCC's impact on operational performance, we also don't find significant evidence of the impact of each component of CCC on operational performance when measured by EBIT/TA, in this last measure only DPO has significant impact (at 10% of significance) when control variables and Years-dummies are not included.

*Table 5 – This table reports the estimation of Equation (1.2) for our sample composed by 29 PE-backed companies and 29 non PE-backed companies, using three different proxies of operating performance, expressed in pp. The operating performance measures are regressed against the DSO, DPO and DIO , express in years. We include control variables and year-dummies. We look to Durbin-Watson statistic and we applied HAC estimator when this statistic has a value lower than 1 and higher than 3. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively. Variables are winsorised between 0.05 and 0.95 percentile. Standard deviations are in brackets.*

	Gross Margin/TA			EBITDA/TA			EBIT/TA		
	(A)	(B)	(C)	(A)	(B)	(C)	(A)	(B)	(C)
DSO	-17.91 **	-21.79 **	-21.84 **	-1.47	-2.22 *	-1.90	-0.38	-0.77	0.56
	(8.20)	*(10.49)*	*(10.58)*	*(1.55)*	*(1.29)*	*(1.30)*	*(1.53)*	*(1.20)*	*(1.18)*
DIO	-187.17 ***	-179.69 ***	-184.23 ***	-14.63 *	-12.54 *	-12.67 *	-6.41	-7.60	-7.50
	(47.95)	*(43.48)*	*(44.42)*	*(7.99)*	*(7.34)*	*(7.10)*	*(7,29)*	*(6.78)*	*(6.53)*
DPO	-10.99	-17.39	-14.93	-10.94 **	-10.16 **	-9.83 **	-9.03 *	-4.26	-4.42
	(37.95)	*(32.56)*	*(33.35)*	*(5.76)*	*(5.01)*	*(5.11)*	*(5.54)*	*(4.89)*	*(4.82)*
Controls	not included	included	included	not included	included	included	not included	included	included
D years	not included	not included	included	not included	not included	included	not included	not included	included
Obs	284	284	284	284	284	284	284	284	284
R^2	0.16	0.21	0.22	0.13	0.19	0.25	0.06	0.21	0.25
Adj. R^2	0.15	0.19	0.19	0.12	0.18	0.22	0.05	0.20	0.21
F-stats	17.53 ***	12.29 ***	6.00 ***	13.77 ***	11.02 ***	7.03 ***	6.42 ***	12.43 ***	6.86 ***
HAC	used	used	used	used	used	used	used	used	used

The potential impact of PE ownership in the operational performance was also tested (regression 1.2.). As we can see in table 6, the WCM of PE own companies has a lower impact in the Gross Margin/TA ratio than WCM impact in the Gross Margin/TA ratio of non PE-backed firms, (The coefficient of CCC x PE is positive).

While the results using EBITDA/TA and EBIT/TA as operational performance measures don't show significant differences between the impact of WCM on PE-backed firms and the impact of WCM on non PE-backed firms (The coefficient of CCC*PE is not significant).

*Table 6 – This table provides the isolated PE effect on independent variables in Operational Performance regression (1.1) for our sample composed by 29 PE-backed and 29 non PE-backed firms, checking three different proxies of Return on Assets as previously presented. Return on Assets proxies are tested against CCC and CCC*PE. We include control variables and years-dummies. We look to Durbin-Watson statistic and we applied HAC estimator when this statistic has a value lower than 1 and higher than 3. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively. Values are winsorised between 0.05 and 0.95 percentile. Standard deviations are in brackets.*

	Gross Margin/TA			EBITDA/TA			EBIT/TA		
	(A)	(B)	(C)	(A)	(B)	(C)	(A)	(B)	(C)
CCC	-45.17 ***	-121.42 ***	-121.24 ***	-2.17	-7.53 *	-7.35 *	1.41	1.10	1.11
	(13.48)	*(13.72)*	*(25.35)*	*(3.28)*	*(4.24)*	*(4.43)*	*(2.56)*	*(3.14)*	*(3.34)*
CCC*PE	-19.41	107.51 ***	107.65 ***	-7.55 ***	2.32	3.70	-7.99 ***	-5.84 *	-4.89
	(16.75)	*(18.74)*	*(25.72)*	*(3.21)*	*(4.71)*	*(4.93)*	*(2.85)*	*(3.73)*	*(3.93)*
Controls	not included	included	included	not included	included	included	not included	included	included
Controls *PE	not included	included	included	not included	included	included	not included	included	included
D years	not included	not included	included	not included	not included	included	not included	not included	included
Obs	284	284	284	284	284	284	284	284	284
R^2	0.074	0.425	0.439	0.060	0.174	0.240	0.050	0.215	0.248
Adj. R^2	0.067	0.409	0.408	0.053	0.150	0.197	0.043	0.192	0.206
F-stats	11.19 ***	25.45 ***	13.98 ***	8.92 ***	7.23 ***	5.64 ***	7.39 ***	9.42 ***	5.90 ***
HAC	Used	used	used	used	used	used	used	used	used

Table 7 reports also the impact of PE ownership in operational performance through the individual management of each component of CCC: DSO, DPO and DIO.

*Table 7- This table provides the isolated PE effect on independent variables in Operational Performance regression (1.1) for our sample composed by 29 PE-backed and 29 non PE backed firms, checking three different proxies of Return on Assets as previously presented. Return on Assets proxies are tested against DSO, DPO, DIO, DSO*PE, DIO*PE and DPO*PE. We include in an iterative process control variables and years-dummies. We look to Durbin-Watson statistic and we applied HAC estimator when this statistic has a value lower than 1 and higher than 3. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively. Values are winsorised between 0.05 and 0.95 percentile. Standard deviations are in brackets.*

	Gross Margin/TA			EBITDA/TA			EBIT/TA		
	(A)	(B)	(C)	(A)	(B)	(C)	(A)	(B)	(C)
DSO	-28.75	-37.19 **	-37.11 **	-1.79	-2.71	-2.71	0.42	0.33	0.27
	(20.74)	*(18.50)*	*(18.71)*	*(3.13)*	*(3.07)*	*(3.29)*	*(2.71)*	*(2.59)*	*(2.75)*
DSO*PE	10.22	33.44 *	33.34 *	-1.23	0.65	1.34	-2.57	-1.97	-1.43
	(23.57)	*(18.51)*	*(18.81)*	*(3.46)*	*(3.24)*	*(3.47)*	*(3.18)*	*(2.80)*	*(2.90)*
DIO	-246.96 ***	-298.07 ***	-298.37 ***	-16.31 *	-19.97 **	-19.77 **	-8.62	-12.37 *	-12.27 *
	(65.88)	*(65.39)*	*(65.70)*	*(9.42)*	*(9.51)*	*(9.04)*	*(7.78)*	*(7.89)*	*(7.73)*
DIO*PE	119.34 **	349.86 ***	342.54 ***	-1.86	16.15	15.46	1.07	7.11	7.07
	(58.80)	*(70.66)*	*(70.90)*	*(11.42)*	*(14.44)*	*(13.94)*	*(11.97)*	*(14.40)*	*(14.00)*
DPO	57.65	2.18	3.87	-4.70	-7.27	-6.88	-7.43	-5.91	-5.77
	(89.35)	*(72.01)*	*(72.33)*	*(13.08)*	*(12.17)*	*(12.92)*	*(11.01)*	*(10.83)*	*(11.31)*
DPO*PE	-112.56	-29.96	-25.34	-10.49	-4.34	3.80	-4.19	1.42	1.31
	(90.75)	*(80.76)*	*(81.54)*	*(14.25)*	*(13.33)*	*(14.07)*	*(12.55)*	*(11.94)*	*(12.32)*
Controls	not included	included	included	not included	included	included	not included	included	included
Controls *PE	not included	included	included	not included	included	included	not included	included	included
D years	not included	not included	included	not included	not included	included	not included	not included	included
Obs	284	284	284	284	284	284	284	284	284
R^2	0.19	0.50	0.51	0.17	0.26	0.31	0.10	0.24	0.27
Adj. R^2	0.17	0.48	0.48	0.15	0.23	0.26	0.08	0.21	0.22
F-stats	10.51 ***	22.70 ***	14.50 ***	9.45 ***		6.36 ***	5.11 ***	7.09 ***	5.18 ***
HAC	used	used	used	used	used	used	used	used	used

Identical to the results regarding differences in CCC impact on operational performance between PE-backed and non PE-backed firms, table 7 suggests that also DSO and DIO reductions in PE-backed firms have a lower impact on operational performance, when measured by Gross Margin/TA ratio (for other measures there isn't significant evidence).

In addition, we test the impact direct of PE dummy on operational performance without using other explainable variables (see table 8).

*Table 8 - This table reports the estimation of an extra equation for our sample composed by 29 PE-backed companies and 29 non PE-backed companies, using three different proxies of operating performance. The operating performance measures are regressed against the dummy PE. We look to Durbin-Watson statistic and we applied HAC estimator when this statistic has a value lower than 1 and higher than 3. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively. Variables are winsorised between 0.05 and 0.95 percentile. Standard deviations are in brackets.*

	Gross Margin/TA	EBITDA/TA	EBIT/TA
	(A)	(B)	(C)
PE	-29.43 **	-4.42 **	-3.28 **
	(12.78)	*(1.90)*	*(1.54)*
Obs	284	284	284
R^2	0.06	0.06	0.04
Adj. R^2	0.06	0.05	0.04
F-stats	19.00 ***	17.06 ***	6.00 ***
HAC	used	used	used

This allows us to check that PE-backed firms under-perform non PE-backed firms in operating terms, during the period where PE-backed firms were owned by PE firms: less 29.43 pp. in Gross Margin/TA, less 4.42 pp. and less 3.28 pp. in EBIT/TA, possibly it may indicate that PE-backed firms should make extra efforts to improve their operational performance through, for instance, their WCM.

4.2. Do PE-backed firms manage WC better?

In previous section, we find evidence that a lower CCC improves the operational performance of the companies, as it can be seen as the best WCM practice. Given so, we now regress equation 2.1 using the components of the CCC (DIO, DSO and DPO) as endogenous variables, in order to understand how PE-backed firms manage their WCM in comparison with non PE-backed firms.

As shown in Table 9, none of the coefficients associated to the PE variable is statistically significant. Although we cannot conclude that companies owned by PE firms manage better the WC, the WCM may be improved by PE-entry (analysed in next section).

*Table 9 – This table provides results of equation 2 for our sample composed by 29 PE-backed and 29 non PE-backed firms. CCC is tested against PE-ownership dummy. We include in an iterative process control variables, years-dummies and sector dummy. We look to Durbin-Watson statistic and we applied HAC estimator when this statistic has a value lower than 1 and higher than 3. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively. Values are winsorised between 0.05 and 0.95 percentile. Standard deviations are in brackets.*

	CCC			
	(A)	(B)	(C)	(D)
PE	-0.05	0.02	0.01	0.02
	(0.06)	*(0.05)*	*(0.05)*	*(0.05)*
Controls	not included	included	included	included
D years	not included	not included	included	included
Industry effects	not included	not included	not included	included ***
Obs	284	284	284	284
R^2	0.007	0.100	0.116	0.170
Adj. R^2	0.004	0.087	0.080	0.133
F-stats	2.09	7.74 ***	3.24***	4.62 ***
HAC	used	used	used	used

Despite of inexistence of significant evidence, the positive signal of regressor associated with dummy PE indicates a competitive disadvantage of PE-backed firms in WCM.

In addition, we study PE-ownership impact on DSO, DIO and DPO (see table 10). We only found PE-ownership impact on DIO, PE-backed firms have a lower level of DIO, less almost 15 days (0.04*365).

If there were statistical significance of PE-ownership impact on DPO and DSO, it would be consistent with a better management of these fields by PE-backed firms. PE-ownership regressor is positive for DPO and negative for DIO and DSO.

As controls, we also check impact of each component in others and we found strong evidence of DSO impact on DPO and vice versa. DIO loss impact on DSO and DPO when industry effects are controlled. In fact, industry effects only have significant impact on DIO. DSO increases as well DPO increases and DIO decreases. DPO increases with both DSO and DIO

*Table 10 - This table provides the estimation of three different versions of Equation (3) substituting CCC by DSO, DIO and DPO, for our sample composed by 29 PE-backed and 29 non PE-backed firms. DSO, DIO and DPO (expressed in years) are tested against PE dummy and to others CCC components only excluding itself. We include control variables, years-dummies and a sector dummy. We look to Durbin-Watson statistic and we applied HAC estimator when this statistic has a value lower than 1 and higher than 3. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively. Values are winsorised between 0.05 and 0.95 percentile. Standard deviations are in brackets.*

	DSO			
	(A)	(B)	(C)	(D)
PE	-0.08	-0.02	-0.02	-0.02
	(0.09)	*(0.08)*	*(0.08)*	*(0.08)*
DPO	2.68 ***	2.47 ***	2.46 ***	2.45 ***
	(0.49)	*(0.46)*	*(0.47)*	*(0.48)*
DIO	-1.07 ***	-0.79 **	-0.80 **	-0.86
	(0.36)	*(0.41)*	*(0.42)*	*(0.86)*
Controls	not included	included	included	included
D years	not included	not included	included	included
Industry effects	not included	not included	not included	included
Obs	284	284	284	284
R^2	0.53	0.55	0.55	0.55
Adj. R^2	0.53	0.54	0.53	0.53
F-stats	106.29 ***	55.73 ***	25.61 ***	23.71 ***
HAC	used	used	used	used

	DPO			
	(A)	(B)	(C)	(D)
PE	0.01	0.02	0.02	0.01
	(0.03)	*(0.03)*	*(0.02)*	*(0.03)*
DSO	0.20 ***	0.17 ***	0.17 ***	0.16 ***
	(0.03)	*(0.03)*	*(0.03)*	*(0.03)*
DIO	0.31 ***	0.37 ***	0.37 ***	0.29 *
	(0.10)	*(0.12)*	*(0.12)*	*(0.16)*
Controls	not included	included	included	included
D years	not included	not included	included	included
Industry effects	not included	not included	not included	included
Obs	284	284	284	284
R^2	0.53	0.58	0.59	0.59
Adj. R^2	0.53	0.57	0.57	0.57
F-stats	107.08 ***	62.70 ***	29.95 ***	27.97 ***
HAC	used	used	used	used

	DIO			
	(A)	(B)	(C)	(D)
PE	-0.03	-0.04 *	-0.04 *	-0.04 **
	(0.02)	*(0.02)*	*(0.02)*	*(0.02)*
DSO	-0.05 ***	-0.03 ***	-0.03 ***	-0.02
	(0.02)	*(0.01)*	*(0.01)*	*(0.02)*
DPO	0.19 ***	0.22 ***	0.22 ***	0.11 *
	(0.07)	*(0.08)*	*(0.08)*	*(0.06)*
Controls	not included	included	included	included
D years	not included	not included	included	included
Industry effects	not included	not included	not included	included ***
Obs	284	284	284	284
R^2	0.08	0.16	0.16	0.50
Adj. R^2	0.07	0.14	0.12	0.47
F-stats	7.96 ***	8.67 ***	4.06 ***	19.25 ***
HAC	used	used	used	used

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Bearing in mind that there isn't (significant) evidence of a better (or worst) WCM by PE-backed firms compared with non PE-backed firms, we present the results regarding PE acquisition impact on this field in next subsection

4.3. Do PE-entries improve WCM?

More relevant to the future of PE-industry than looking to a potential competitive (dis)advantage on the WCM of firms owned by PE-funds, it is looking to the impact of PE-entry on the WCM of acquired companies.

We regress equation 2.1[1] to check a potential impact of PE-entry on WCM (see table 11 and 12), despite of our PE-entry coefficients being negative indicating a reduction from 4 (=-0.01 year*365 days) to 18 days on CCC after PE-entry, that CCC reduction is not statistically significant.

*Table 11 – This table refers to regression 2.2. where we try to check PE-entry impact on WCM, computing CCC against dummies PE, AF and the interaction between both: PE*AF. We also add some control variables, industry effects and time effects. Our sample is composed by 29 PE-backed and 29 non-PE backed firms and take in account a period composed by the 3 years after the acquisition and the 3 years before. We look to Durbin-Watson statistic and we applied HAC estimator when this statistic has a value lower than 1 and higher than 3. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively. Values are winsorised between 0.05 and 0.95 percentile. Standard deviations are in brackets.*

	CCC (years)					
	(A)	(B)	(C)	(D)	(E)	(F)
PE * AF	-0.01	-0.05	-0.10 *	-0.10 *	-0.05	-0.05
	(0.05)	*(0.05)*	*(0.06)*	*(0.06)*	*(0.07)*	*(0.06)*
PE		0.05	0.08	0.08	0.05	0.05
		(0.05)	*(0.06)*	*(0.06)*	*(0.06)*	*(0.06)*
AF			0.06	0.06 *	0.04	-0.05
			(0.04)	*(0.04)*	*(0.04)*	*(0.06)*
Industry effects	not included	not included	not included	included *	included *	included
Controls	not included	not included	not included	not included	included	included
D years	not included	not included	not included	not included	not included	included
Obs	295	295	295	295	279	279
R^2	0.00	0.01	0.01	0.04	0.04	0.11
Adj. R^2	0.00	0	0	0.03	0.01	0.06
F-stats	0.10	1.12	1.43	3.16 ***	1.58	2.05 ***
HAC	used	used	used	used	used	used

Indeed, there is solo a result with significance: a worst WCM (more 22 days of CCC) on non PE-backed firms in the period after the acquisition of PE-backed firms, although with no relevance for our study.

[1] We firstly confirm if the negative relationship between CCC and operational performance measures keeps valid in the period here analysed. (see appendix II)

*Table 12 - Difference in Difference extensive analysis of PE-entry impact on WCM. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively to a Wald-test where restrictions are given by DiD method. Our sample is composed by 29 PE-backed firms and 29 non PE-backed firms regarding the period composed by three years after and three years before acquisition. CCC is measured in years.*

CCC (A)	
DID - PE vs non PE (AF=0)	-
DID - PE vs non PE (AF=1)	-0.01
DID - Before vs After (PE=0)	-
DID - Before vs After (PE=1)	**-0.01**

CCC (B)	
DID - PE vs non PE (AF=0)	0.05
DID - PE vs non PE (AF=1)	0.01
DID - Before vs After (PE=0)	-
DID - Before vs After (PE=1)	**-0.05**

CCC (C)	
DID - PE vs non PE (AF=0)	0.08
DID - PE vs non PE (AF=1)	-0.02
DID - Before vs After (PE=0)	0.06
DID - Before vs After (PE=1)	**-0.05**

CCC (D)	
DID - PE vs non PE (AF=0)	0.08
DID - PE vs non PE (AF=1)	-0.02
DID - Before vs After (PE=0)	0.06 *
DID - Before vs After (PE=1)	**-0.04**

CCC (E)	
DID - PE vs non PE (AF=0)	0.05
DID - PE vs non PE (AF=1)	0.00
DID - Before vs After (PE=0)	0.04
DID - Before vs After (PE=1)	**-0.01**

CCC (F)	
DID - PE vs non PE (AF=0)	0.05
DID - PE vs non PE (AF=1)	0.00
DID - Before vs After (PE=0)	0.05
DID - Before vs After (PE=1)	**-0.01**

In fact, looking to each component of CCC our results indicate a negative impact of PE-entry on DIO and DSO and a null impact on DPO (see table 13), notwithstanding our results don't show a significance below 10%. The only evidence with significance at 10% is the negative impact of PE-entry on DSO when analysed in the period composed by three years before and three years after PE-entry and controlling by control variables, time effects and industry effects. In this case, PE-entry decreases DSO in approximately 35 days. Simultaneously, there is evidence of a higher level of DSO in PE-backed firms in comparison with non PE-backed firms before acquisition, at least 25 days higher.

Regarding DIO as we said there is not significant evidence, but our results appoint to a lower level of DIO in PE-backed firms in comparison with non PE-backed firms before acquisition at least 3 days lower.

*Table 13 – These tables report the result for regression 2.2. substituting CCC for each individual component (in this case DSO) to check PE-entry impact on this component. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided). Our sample is composed by 29 PE-backed firms and 29 non PE-backed firms regarding the period composed by three years after and three years before acquisition. DSO, DIO and DPO are measured in years. Standard deviations are in brackets.*

	DSO					
	(A)	(B)	(C)	(D)	(E)	(F)
DPO	0.93 ***	0.92 ***	0.92 ***	0.92 ***	0.89 ***	0.82 ***
	(0.20)	*(0.20)*	*(0.20)*	*(0.20)*	*(0.22)*	*(0.22)*
DIO	-0.29 *	-0.27 *	-0.27 *	-0.22	-0.19	-0.23
	(0.17)	*(0.16)*	*(0.16)*	*(0.22)*	*(0.24)*	*(0.24)*
PE * AF	0.00	-0.05	-0.09 *	-0.09 *	-0.06	-0.07
	(0.04)	*(0.04)*	*(0.05)*	*(0.05)*	*(0.05)*	*(0.05)*
PE		0.08 *	0.10 **	0.10 **	0.10 **	0.10 **
		(0.05)	*(0.05)*	*(0.05)*	*(0.05)*	*(0.05)*
AF			0.03	0.03	0.04	0.00
			(0.03)	*(0.03)*	*(0.03)*	*(0.04)*
Industry effects	not included	not included	not included	included	included	included
Controls	not included	not included	not included	not included	included	included
D years	not included	not included	not included	not included	not included	included
Obs	197	197	197	197	188	188
R^2	0.36	0.3	0.3	0.3	0.29	0.36
Adj. R^2	0.35	0.28	0.28	0.28	0.26	0.30
F-stats	36.57 ***	20.53 ***	16.54 ***	13.79 ***	8.15 ***	5.96 ***
HAC	used	used	used	used	used	used

	DIO					
	(A)	(B)	(C)	(D)	(E)	(F)
DSO	-0.06	-0.06	-0.06	-0.02	-0.02	-0.03
	(0.04)	*(0.04)*	*(0.04)*	*(0.04)*	*(0.05)*	*(0.05)*
DPO	0.35 ***	0.35 ***	0.35 ***	0.21 ***	0.24 ***	0.24 ***
	(0.09)	*(0.09)*	*(0.09)*	*(0.08)*	*(0.09)*	*(0.09)*
PE * AF	-0.02	-0.01	-0.02	-0.01	-0.01	-0.01
	(0.02)	*(0.02)*	*(0.03)*	*(0.03)*	*(0.03)*	*(0.03)*
PE		-0.02	-0.01	-0.02	-0.03	-0.03
		(0.03)	*(0.03)*	*(0.03)*	*(0.03)*	*(0.03)*
AF			0.01	0.01	0.00	-0.01
			(0.02)	*(0.02)*	*(0.02)*	*(0.02)*
Industry effects	not included	not included	not included	included ***	included ***	included ***
Controls	not included	not included	not included	not included	included	included
D years	not included	not included	not included	not included	not included	included
Obs	295	295	295	295	279	279
R^2	0.14	0.15	0.15	0.41	0.43	0.44
Adj. R^2	0.13	0.13	0.13	0.40	0.41	0.40
F-stats	16.21	12.37 ***	9.90 ***	33.61 ***	22.81 ***	11.41 ***
HAC	used	used	used	used	used	used

	DPO					
	(A)	(B)	(C)	(D)	(E)	(F)
DSO	0.26 ***	0.27 ***	0.27 ***	0.27 ***	0.24 ***	0.24 ***
	(0.05)	*(0.05)*	*(0.05)*	*(0.05)*	*(0.05)*	*(0.05)*
DIO	0.37 ***	0.36 ***	0.36 ***	0.32 ***	0.32 ***	0.32 ***
	(0.08)	*(0.08)*	*(0.08)*	*(0.10)*	*(0.09)*	*(0.10)*
PE * AF	0.01	0.02	0.04 *	0.04 *	0.01	0.01
	(0.02)	*(0.02)*	*(0.03)*	*(0.03)*	*(0.03)*	*(0.03)*
PE		-0.02	-0.03	-0.04	-0.01	-0.02
		(0.03)	*(0.03)*	*(0.03)*	*(0.02)*	*(0.02)*
AF			0.02	-0.02	-0.01	0.00
			(0.02)	*(0.02)*	*(0.02)*	*(0.02)*
Industry effects	not included	not included	not included	included	included	included
Controls	not included	not included	not included	not included	included	included
D years	not included	not included	not included	not included	not included	included
Obs	295	295	295	295	279	279
R^2	0.32	0.33	0.33	0.33	0.41	0.42
Adj. R^2	0.31	0.32	0.32	0.32	0.39	0.38
F-stats	45.80 ***	34.91***	28.24 ***	23.69 ***	20.55 ***	10.35 ***
HAC	used	used	used	used	used	used[2]

As it is possible conclude: there isn't evidence of value creation on WCM!

4.4. Do PE backed firms need focus on WCM?

Thus in addition, we regress operational performance measures against dummies: PE, PE*AF and AF, in order to check the direct impact of PE acquisition in operational performance (see Table 14).

To infer if PE acquisition creates value or if it is based in an ex-ante screening process, we apply Difference-in-difference method.

[2] It is important to denote that these results refer to a period composed by 3 years after and 3 years before the acquisition, the results could be different if we use a different period composition. In order to robust our analysis we regressed the same equation 2.1. to a period composed by 2 years after and 2 years before and we found similar results. (see appendix III and IV)

*Table 14 - This table provides the PE-entry impact in Operational Performance for our sample composed by 29 PE-backed and 29 non PE-backed firms, in the period composed by 3 years before and 3 years after the PE-entry. Operating performance (expressed in pp.) proxies are tested against CCC, PE*AF, PE and AF. We include in an iterative process control variables and years-dummies. We look to Durbin-Watson statistic and we applied HAC estimator when this statistic has a value lower than 1 and higher than 3. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively. Values are winsorised between 0.05 and 0.95 percentile. Standard deviations are in brackets..*

	Gross Margin/TA	EBITDA/TA	EBIT/TA
	(A)	(B)	(D)
PE*AF	23.69 **	-8.30 ***	-7.10 ***
	(11.60)	*(3.06)*	*(2.43)*
PE	-44.15 ***	3.75	3.46
	(10.58)	*(2.80)*	*(2.42)*
AF	3.33	7.63 ***	5.86 ***
	(14.35)	*(2.60)*	*(2.11)*
Dyears	included	included	included
Obs	296	296	296
R^2	0.14	0.29	0.27
Adj. R^2	0.11	0.26	0.24
F-stats	4.19 ***	10.24 ***	9.90 ***
HAC	used	used	used

Table 15 provides the results regarding DiD applied to operational performance. These results indicate that PE acquisition create value when operating performance is measured by Gross Margin/TA and there isn't significant evidence of value creation when measured by the two other measures of operating performance. Notwithstanding, the results are consistent with value creation through sales and gross margin and not through other operating fields.

*Table 15 - Difference in Difference extensive analysis of PE-entry impact on Operational Performance, using three different measures of operational performance (expressed in pp). We use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively to a Wald-test where restrictions are given by DiD method. Our samples is composed by 29 PE-backed firms and 29 non PE-backed firms regarding the period composed by three years after and three years before acquisition.*

Operational Performance	Gross Margin/TA
DID - PE vs non PE (AF=0)	-44.15 ***
DID - PE vs non PE (AF=1)	-20.46 *
DID - Before vs After (PE=0)	3.33
DID - Before vs After (PE=1)	**27.02 *****

Operational Performance	EBIT/TA
DID - PE vs non PE (AF=0)	3.46
DID - PE vs non PE (AF=1)	-3.63 **
DID - Before vs After (PE=0)	5.86 ***
DID - Before vs After (PE=1)	**-1.25**

Operational Performance	EBITDA/TA
DID - PE vs non PE (AF=0)	3.75
DID - PE vs non PE (AF=1)	-4.56 **
DID - Before vs After (PE=0)	7.63 ***
DID - Before vs After (PE=1)	**-0.67**

In fact, the results show that PE firms choose firms with a lower Gross Margin/TA (less 44.15 pp.) and an improvement in this ratio after the acquisition by almost 27 pp.

Regarding EBITDA and EBIT to Total Assets ratio the results are not significant, we can only conclude that 1) after the acquisition non PE-backed firms outperform PE-backed firms by 4.56 pp. and 3.63pp. respectively and 2) non PE-backed firms improved their operational performance in the period when similar PE-backed firms are owned by PE firms. Results not relevant for our dissertation proposal. If the results were significant we could say that PE firms destroy operational value (less 1.25 pp. on EBIT/TA and less -0.67 pp. on EBITDA/TA).

5. Conclusions

The most consistent conclusion of our study is that Working Capital Management matters. In the two analysis: the one that involves all PE-ownership period and the one that involves only three or two years before and three or two years after acquisition, our coefficients associated to the Cash Conversion Cycle variable are negative and statistically significant suggesting, as predicted by Deloof (2003) and Aktas et al. (2015), that the best way to manage WCM is reducing the company CCC. In our case, a decrease of 100 days on CCC could result in an increase of more than 9pp in Operational performance when measured by Gross Margin/TA.

We also have analysed the impact of each CCC component individually in the operational performance and results are consistent with the aggregate impact in the CCC, i.e., as DSO and DIO decrease, Gross Margin and EBITDA to TA ratio increase. Regarding the DPO, the impact is only statistically significant on EBITDA/TA, however its coefficient is also negative too all measures of operational performance.

Looking to the impact of the PE-ownership impact in the Working Capital Management, our results suggest that is not statistically significant.

However, if we look individually to each component of the CCC, our results show that PE-entry tends to reduce the DSO after the acquisition which suggest that PE firms manage better the trade credit of companies they acquire.

Additionally, our analysis provides evidence of operating underperformance of PE-backed firms which ranges from approximately -29pp. in Gross Margin/TA to approximately -3pp. in EBIT/TA. However, the underperformance in Gross margin/TA is already presented previously to the PE acquisition. In case of EBITDA and EBIT to TA ratios, there isn't significant evidence of a potential over or underperformance of PE-target companies over non PE-target companies before the acquisition. In fact, also there isn't significant evidence of improvements in these ratios after the acquisition.

Consistently, our results show a positive impact of PE acquisition on the Gross Margin/TA ratio, consistent with value creation through increasing sales, an increase of 27pp., but also show a negative (but not significant) impact on operating performance

when measured by EBITDA and EBIT to TA ratio. A maximum loss of 1.25pp. in case of EBITDA/TA to 0.67 pp. in case of EBIT/TA.

Overall, our study shows strong evidence that PE-entry have a not clear impact in the operational performance of acquired companies. Although PE-entry have a positive and significant impact in the Gross Margin/TA, it also has a negative (but not significant) impact in the EBITDA/TA and EBIT/TA. These results are consistent with the ability to increase sales margin suggested by Acharya et al. (2010) and with the inexistence of evidence of operating gains, suggested by Leslie and Oyer (2008).

Our dissertation, mainly, did not find evidence of a better management of Working Capital by PE-backed firms or improvements after the PE-entry. Indeed, our results report a lower impact of WCM on PE-backed firms than on non PE-backed firms. These results suggest that Working Capital Management remains an area to be improved by PE firms and PE-backed firms should focus in the WCM in order to improve the operating performance of the companies they acquire.

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Appendixes

Appendix I - General Concepts

Acronym	Concept	Explanation
CCC	Cash Conversion Cycle	Time needed to convert inputs into cash.
DIO	Days Inventories Outstanding	Days needed to convert inventories into cash.
DPO	Days Payables Outstanging	Days needed to pay suppliers
DSO	Days Sales Outstanding	Days needed to collect cash from costumers
EBIT	Earnings before interests	
EBITDA	Earnings before interests and Depreciations & Amortizations	
G	Fixed assets growth	
LBO	Leverage buyout	Type of Private Equity investment which involves a high amount of debt
LEV	Leverage	Measured by total debt/total assets
OP	Operational Performance	Performance provided by operational (not financial) issues
PE	Private Equity	Type of investment done by Private Investors/funds in private or public companies, keeping or converting into private.
PE firm	Private Equity firm	Firm which make Private Equity investments
ROA	Return on Assets	Given by Returns/Total assets
SIZE	Size	Given by natural logarithm of sales
TA	Total Assets	
WC	Working Capital	
WCM	Working Capital Management	

Appendix II – CCC impact on operational performance in the period composed by 3 years after and 3 years before PE acquisition

	Gross Margin/TA			EBITDA/TA			EBIT/TA		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
CCC	-35.23 ***	-33.09 *	-35.98 **	-7.40	-7.77 **	-5.07	-3.94	-4.61	-2.30
	(18.10)	*(18.08)*	*(18.26)*	*(5.07)*	*(4.11)*	*(4.32)*	*(4.55)*	*(3.45)*	*(3.43)*
Controls	not included	included	included	not included	included	included	not included	included	included
D years	not included	not included	included	not included	not included	included	not included	not included	included
Obs	290	279	279	284	284	284	284	284	284
R^2	0.03	0.05	0.07	0.02	0.25	0.36	0.01	0.28	0.39
Adj. R^2	0.03	0.04	0.03	0.02	0.24	0.33	0.00	0.27	0.36
F-stats	8.44 ***	3,84 ***	1.70 **	6.23 ***	23.44 ***	12.41 ***	2.38	27.00 ***	14.17 ***
HAC	used	used	used	used	used	used	used	used	used

Appendix III – PE impact on CCC in the period composed by 2 years after and 2 years before PE acquisition

	CCC					
	(1)	(2)	(3)	(4)	(5)	(6)
PE * AF	-0.01	-0.04	-0.08	-0.07	-0.04	-0.05
	(0.05)	*(0.05)*	*(0.06)*	*(0.06)*	*(0.07)*	*(0.07)*
PE		0.05	0.07	0.06	0.06	0.06
		(0.06)	*(0.06)*	*(0.06)*	*(0.07)*	*(0.06)*
AF			0.04	0.04	0.03	-0.02
			(0.04)	*(0.04)*	*(0.04)*	*(0.06)*
Industry effects	not included	not included	not included	included *	included *	included
Controls	not included	not included	not included	not included	included	included
D years	not included	not included	not included	not included	not included	included
Obs	197	197	197	197	188	188
R^2	0.00	0.00	0.01	0.04	0.05	0.11
Adj. R^2	0.00	0.00	0.00	0.02	0.02	0.04
F-stats	0.02	0.73	1.43	1.94 *	1.49	1.60 *
HAC	used	used	used	used	used	used

Appendix IV – DiD conclusions of PE impact on CCC in the period composed by 2 years after and 2 years before PE acquisition

CCC (1)	
DID - PE vs non PE (AF=0)	-
DID - PE vs non PE (AF=1)	-0.01
DID - Before vs After (PE=0)	-
DID - Before vs After (PE=1)	**-0.01**

CCC (2)	
DID - PE vs non PE (AF=0)	0.05
DID - PE vs non PE (AF=1)	0.01
DID - Before vs After (PE=0)	-
DID - Before vs After (PE=1)	**-0.05**

CCC (3)	
DID - PE vs non PE (AF=0)	0.08
DID - PE vs non PE (AF=1)	-0.02
DID - Before vs After (PE=0)	0.06
DID - Before vs After (PE=1)	**-0.05**

CCC (4)	
DID - PE vs non PE (AF=0)	0.08
DID - PE vs non PE (AF=1)	-0.02
DID - Before vs After (PE=0)	0.06 *
DID - Before vs After (PE=1)	**-0.04**

CCC (5)	
DID - PE vs non PE (AF=0)	0.05
DID - PE vs non PE (AF=1)	0.00
DID - Before vs After (PE=0)	0.04
DID - Before vs After (PE=1)	**-0.01**

CCC (6)	
DID - PE vs non PE (AF=0)	0.05
DID - PE vs non PE (AF=1)	0.00
DID - Before vs After (PE=0)	-0.05
DID - Before vs After (PE=1)	**-0.01**

Appendix IV –PE impact on each component of CCC in the period composed by 2 years after and 2 years before PE acquisition

	DSO					
	(1)	(2)	(3)	(4)	(5)	(6)
DPO	0.93 ***	0.92 ***	0.92 ***	0.92 ***	0.89 ***	0.82 ***
	(0.20)	*(0.20)*	*(0.20)*	*(0.20)*	*(0.22)*	*(0.22)*
DIO	-0.29 *	-0.27 *	-0.27 *	-0.22	-0.19	-0.23
	(0.17)	*(0.16)*	*(0.16)*	*(0.22)*	*(0.24)*	*(0.24)*
PE * AF	0.00	-0.05	-0.09 *	-0.09 *	-0.06	-0.07
	(0.04)	*(0.04)*	*(0.05)*	*(0.05)*	*(0.05)*	*(0.05)*
PE		0.08 *	0.10 **	0.10 **	0.10 **	0.10 **
		(0.05)	*(0.05)*	*(0.05)*	*(0.05)*	*(0.05)*
AF			0.03	0.03	0.04	0.00
			(0.03)	*(0.03)*	*(0.03)*	*(0.04)*
Industry effects	not included	not included	not included	included	included	Included
SIZE	not included	not included	not included	not included	included	included
D years	not included	not included	not included	not included	not included	Included
Obs	197	197	197	197	188	188
R^2	0.36	0.3	0.3	0.3	0.29	0.36
Adj. R^2	0.35	0.28	0.28	0.28	0.26	0.30
F-stats	36.57 ***	20.53 ***	16.54 ***	13.79 ***	8.15 ***	5.96 ***
HAC	used	used	used	used	used	Used

	DIO					
	(1)	(2)	(3)	(4)	(5)	(6)
DSO	-0.09 **	-0.08 **	-0.09 **	-0.05	-0.04	-0.05
	(0.04)	*(0.04)*	*(0.04)*	*(0.04)*	*(0.05)*	*(0.05)*
DPO	0.36 ***	0.36 ***	0.36 ***	0.21 ***	0.24 ***	0.24 ***
	(0.08)	*(0.09)*	*(0.09)*	*(0.08)*	*(0.09)*	*(0.09)*
PE * AF	-0.02	-0.01	-0.02	-0.01	-0.01	-0.02
	(0.02)	*(0.02)*	*(0.03)*	*(0.03)*	*(0.03)*	*(0.03)*
PE		-0.01	-0.01	-0.02	-0.02	-0.02
		(0.03)	*(0.03)*	*(0.03)*	*(0.03)*	*(0.03)*
AF			0.01	0.01	0.00	-0.01
			(0.02)	*(0.02)*	*(0.02)*	*(0.03)*
Industry effects	not included	not included	not included	included ***	included ***	included ***
SIZE	not included	not included	not included	not included	included	Included
D years	not included	not included	not included	not included	not included	Included
Obs	197	197	197	197	188	188
R^2	0.15	0.15	0.15	0.42	0.44	0.45
Adj. R^2	0.13	0.13	0.13	0.4	0.42	0.40
F-stats	10.97 ***	8.33***	6.66 ***	22.55 ***	15.79 ***	8.91 ***
HAC	used	used	used	used	used	Used

	DPO					
	(1)	(2)	(3)	(4)	(5)	(6)
DSO	0.30 ***	0.30 ***	0.31 ***	0.31 ***	0.25 ***	0.24 ***
	(0.06)	*(0.06)*	*(0.06)*	*(0.06)*	*(0.06)*	*(0.06)*
DIO	0.38 ***	0.37 ***	0.38 ***	0.32 ***	0.31 ***	0.32 ***
	(0.09)	*(0.09)*	*(0.09)*	*(0.10)*	*(0.10)*	*(0.10)*
PE * AF	0.00	0.01	0.02	0.02	0.00	0.00
	(0.02)	*(0.02)*	*(0.02)*	*(0.03)*	*(0.03)*	*(0.03)*
PE		-0.02	-0.02	-0.03	-0.01	-0.01
		(0.03)	*(0.03)*	*(0.03)*	*(0.03)*	*(0.03)*
AF			-0.01	-0.01	-0.01	0.00
			(0.02)	*(0.02)*	*(0.02)*	*(0.02)*
Industry effects	not included	not included	not included	included	included	included
Controls	not included	not included	not included	not included	included	included
D years	not included	not included	not included	not included	not included	included
Obs	197	197	197	197	188	188
R^2	0.36	0.37	0.37	0.37	0.44	0.46
Adj. R^2	0.35	0.35	0.35	0.35	0.42	0.41
F-stats	36.57 ***	27.64 ***	22.02 ***	22.55 ***	15.79 ***	9.14 ***
HAC	used	used	used	used	used	used